

WHAT IS CLAIMED IS:

1. A communication system using packet switching for conducting packet communication between a server and a client through a switching apparatus, wherein

said switching apparatus

during relay of a packet to be transmitted from said server to said client, rewrites header information of the packet in question to have the contents which are to be set when the packet in question is sent from said switching apparatus and sends said packet to said client, and

from the time of relay of a data acquisition request from said client until the end of transmission of a packet of an acknowledgement to be transmitted from said server to said client, conducts one-way splicing processing in the direction from the server in question to the client in question, as well as successively conducting retransmission control and flow control of communication in the direction from said client to said server.

2. The communication system as set forth in claim 1, wherein

said switching apparatus comprising

a client side processing unit for accepting a

connection from each said client to manage a connection

with the client in question for transmitting and receiving a packet to and from the client,

a server side processing unit for accessing each said server to manage a connection with the server in question for transmitting and receiving a packet to and from the server,

means for, during relay of a packet to be transmitted from said server to said client, rewriting header information of said packet to send said packet rewritten to said client, and

means for conducting one-way splicing in the direction from said server to the client in question, as well as successively conducting retransmission control and flow control for communication in the direction from said client to said client side processing unit and communication in the direction from said server side processing unit to said server without cutting off an established connection.

3. The communication system as set forth in claim 2, wherein

said client side processing unit including

a client side terminating unit for controlling a connection with each said client to accept a connection and a request from each said client, and

a client side updating unit for rewriting header information of a packet to be transmitted from said

server to said client to relay the rewritten packet, and

10 said server side processing unit including

 a server side terminating unit for managing a
connection with each said server to relay an instruction
and data directed to each said server which are sent
from said client side terminating unit, and

15 a server side updating unit for accepting a
packet to be transmitted from each said server to each
said client to send the packet to said client side
updating unit.

4. The communication system as set forth in claim 3,
wherein

 header information of said packet including

5 a sequence number indicative of, in transmission
data divided into individual packets, order of data in a
packet in question,

 a data length of the packet in question, and

 an Ack number indicative of a sequence number of
data that a communication partner has already received.

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5. The communication system as set forth in claim 4,
wherein

 header information of said packet further
includes

5 a Win value indicative of a remaining capacity of
a reception buffer that the communication partner is yet

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to receive.

6. The communication system as set forth in claim 2,
wherein

said client side terminating unit including
means for notifying header information of a
5 packet received from each said client to said client
side updating unit and said server side terminating unit,
and

said server side updating unit including
means for notifying header information of a
10 packet to be transmitted from each said server to each
said client to said server side terminating unit,

said client side updating unit and said server
side terminating unit

recording and referring to said notified header
15 information to properly rewrite header information of
the packet.

7. The communication system as set forth in claim 6,
wherein

at a state where said one-way splicing processing
is set, said client side terminating unit instructs

5 said client side updating unit to conduct
acknowledgment processing in response to a packet
received from each said client,

said client side updating unit including

means for receiving an instruction of said
acknowledgement processing to generate and send a packet
of an acknowledgement to the client in question.

8. The communication system as set forth in claim 2,
wherein

said server side updating unit
relays transmission of packets from a plurality
of said servers directed to one said client, and
includes means for removing, from header
information of a packet to be relayed, a flag indicative
of the end of transmission of the packet at individual
said server,

thereby relaying a packet transmitted by the
switching of said plurality of servers to said client
without cut-off of a connection with said client.

9. The communication system as set forth in claim 2,
wherein

said client side terminating unit and said server
side terminating unit including

means for restoring transmission data to be
transmitted in individual divisional packets from said
client to said server to an original state prior to the
division to selectively transmit each packet to the
server.

10. The communication system as set forth in claim 2,
further comprising

an analysis unit for determining a server as a
connection destination to which each said client
5 connects,

said analysis unit including

means for obtaining, from said client side
terminating unit, information of a request sent by said
client to each said server,

10 means for determining a server as a connection
destination to which the client in question is to
connect based on said request, and

means for instructing said server side
terminating unit to connect the client in question with
15 said server determined as a connection destination.

11. The communication system as set forth in claim 10,
wherein

said client side terminating unit and said server
side terminating unit including

5 means for restoring transmission data to be
transmitted in individual divisional packets from said
client to said server to an original state prior to the
division and then transmitting the restored packet to
the server in question, and

10 said analysis unit including

means for determining said server as a connection

destination based on said transmission data restored to the original state prior to the division.

12. The communication system as set forth in claim 10, wherein

said analysis unit including

means for sequentially classifying data

5 acquisition requests yet to be processed which are issued by said client into groups according to corresponding servers as connection destinations, and

10 means for instructing, on each said classified group basis, said server side terminating unit to set up a connection to a corresponding server and execute said data acquisition requests classified into the group in question.

13. The communication system as set forth in claim 10, wherein

said analysis unit including

means for sequentially classifying data

5 acquisition requests yet to be processed which are issued by said client into groups according to corresponding servers as connection destinations, and

10 means for instructing, on each said classified group basis, said server side terminating unit to set up a connection to a corresponding server, execute said data acquisition requests classified into the group in

question and cut off the connection with the server after the transmission of the acquisition request.

14. A switching apparatus for relaying packet communication through a communication network between a plurality of servers and clients, wherein said switching apparatus

5 during relay of a packet to be transmitted from said server to said client, rewrites header information of the packet in question to have the contents which are to be set when the packet in question is sent from the switching apparatus and sends said packet to said client, and

10 from the time of relay of a data acquisition request from said client until the end of transmission of a packet of an acknowledgement to be transmitted from said server to said client, conducts one-way splicing processing in the direction from the server in question to the client in question, as well as successively conducting retransmission control and flow control of communication in the direction from said client to said server.

15 20 15. The switching apparatus as set forth in claim 14, comprising

a client side processing unit for accepting a connection from each said client to manage a connection

5 with the client in question for transmitting and
receiving a packet to and from the client,

10 a server side processing unit for accessing each
said server to manage a connection with the server in
question for transmitting and receiving a packet to and
from the server,

means for, during relay of a packet to be
transmitted from said server to said client, rewriting
header information of said packet to send said packet
rewritten to said client, and

15 means for conducting one-way splicing in the
direction from said server to the client in question, as
well as successively conducting retransmission control
and flow control for communication in the direction from
said client to said client side processing unit and
20 communication in the direction from said server side
processing unit to said server without cutting off an
established connection.

16. The switching apparatus as set forth in claim 15,
wherein

said client side processing unit including
a client side terminating unit for managing a
5 connection with each said client to accept a connection
and a request from each said client, and

a client side updating unit for rewriting header
information of a packet to be transmitted from said

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server to said client to relay the rewritten packet, and
10 said server side processing unit including
 a server side terminating unit for managing a
connection with each said server to relay an instruction
and data directed to each said server which are sent
from said client side terminating unit, and
15 a server side updating unit for accepting a
packet to be transmitted from each said server to each
said client to send the packet to said client side
updating unit.

17. The switching apparatus as set forth in claim 16,
wherein

 header information of said packet including
 a sequence number indicative of, in transmission
5 data divided into individual packets, order of data in a
packet in question,
 a data length of the packet in question, and
 an Ack number indicative of a sequence number of
data that a communication partner has already received.

10 18. The switching apparatus as set forth in claim 17,
wherein

 header information of said packet further
includes
5 a Win value indicative of a remaining capacity of
a reception buffer that the communication partner is yet

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to receive.

19. The switching apparatus as set forth in claim 15,
wherein

said client side terminating unit includes
means for notifying header information of a
5 packet received from each said client to said client
side updating unit and said server side terminating unit,
and

said server side updating unit includes
means for notifying header information of a
10 packet to be transmitted from each said server to each
said client to said server side terminating unit,

said client side updating unit and said server
side terminating unit recording and referring to said
notified header information to properly rewrite header
15 information of the packet.

20. The switching apparatus as set forth in claim 19,
wherein

at a state where said one-way splicing processing
is set, said client side terminating unit instructs

5 said client side updating unit to conduct
acknowledgment processing in response to a packet
received from each said client,

said client side updating unit including
means for accepting an instruction of said

10 acknowledgement processing to generate and send a packet
of an acknowledgement to the client in question.

21. The switching apparatus as set forth in claim 15,
wherein

said server side updating unit

relays transmission of packets from a plurality

5 of said servers directed to one said client, and

includes means for removing, from header
information of a packet to be relayed, a flag indicative
of the end of transmission of a packet at individual
said server,

10 thereby relaying a packet transmitted by the
switching of said plurality of servers to said client
without cut-off of a connection with said client.

22. The switching apparatus as set forth in claim 15,
wherein

said client side terminating unit and said server
side terminating unit include

5 means for restoring transmission data to be
transmitted in individual divisional packets from said
client to said server to an original state prior to the
division to selectively transmit each packet to the
server.

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23. The switching apparatus as set forth in claim 15,

further comprising

an analysis unit for determining a server as a
connection destination to which each said client
5 connects,

said analysis unit including

means for obtaining, from said client side
terminating unit, information of a request sent by said
client to each said server,

10 means for determining a server as a connection
destination to which the client in question is to
connect based on said request, and

means for instructing said server side
terminating unit to connect the client in question with
15 said server determined as a connection destination.

24. The switching apparatus as set forth in claim 23,
wherein

said client side terminating unit and said server
side terminating unit include

5 means for restoring transmission data to be
transmitted in individual divisional packets from said
client to said server to an original state prior to the
division and then transmitting the restored packet to
the server in question, and

10 said analysis unit includes

means for determining said server as a connection
destination based on said transmission data restored to

the original state prior to the division.

25. The switching apparatus as set forth in claim 23,
wherein

said analysis unit including
means for sequentially classifying data
5 acquisition requests yet to be processed which are
issued by said client into groups according to
corresponding servers as connection destinations, and
means for instructing, on each said classified
group basis, said server side terminating unit to set up
10 a connection to a corresponding server and execute said
data acquisition requests classified into the group in
question.

26. A packet switching method of a switching
apparatus for relaying packet communication through a
communication network between a plurality of servers and
clients, comprising the steps of:

5 during relay of a packet to be transmitted from
said server to said client, rewriting header information
of the packet in question to have the contents which are
to be set when the packet in question is sent from the
switching apparatus and sending said packet to said
10 client, and

from the time of relay of a data acquisition
request from said client until the end of transmission

of a packet of an acknowledgement to be transmitted from said server to said client, conducting one-way splicing processing in the direction from the server in question to the client in question, as well as successively conducting retransmission control and flow control of communication in the direction from said client to said server.

27. The packet switching method as set forth in claim 26, further comprising the steps of

managing a connection with each said client to accept a connection and a request from each said client, rewriting header information of a packet to be transmitted from said server to said client to relay the rewritten packet, and

managing a connection with each said server to relay an instruction and data directed to each said server which are sent from said client, wherein

header information of said packet includes:

a sequence number indicative of, in transmission data divided into individual packets, order of data in a packet in question,

a data length in and below a transport layer of the packet in question,

an Ack number indicative of a sequence number of data that a communication partner has already received, and

20 a Win value indicative of a remaining capacity of
a reception buffer that the communication partner is yet
to receive.

28. The packet switching method as set forth in claim
27, further comprising the steps of

 relaying transmission of packets from a plurality
of said servers directed to one said client, and

5 removing, from header information of a packet to
be relayed, a flag indicative of the end of transmission
of a packet at individual said server,

 thereby relaying a packet transmitted by the
switching of said plurality of servers to said client
10 without cut-off of a connection with said client.

29. The packet switching method as set forth in claim
27, further comprising the step of

 restoring transmission data to be transmitted in
individual divisional packets from said client to said
5 server to an original state prior to the division to
selectively transmit each packet to the server.

30. The packet switching method as set forth in claim
27, further comprising the steps of

 obtaining information of a request to be
transmitted by said client to each said server,

5 determining a server as a connection destination

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to which the client in question is to connect based on said request, and

giving an instruction to connect the client in question with said server determined as a connection destination,

thereby determining a server as a connection destination to which each said client is to connect.

31. The packet switching method as set forth in claim 30, further comprising the steps of

sequentially classifying data acquisition requests yet to be processed which are issued by said client into groups according to corresponding servers as connection destinations, and

giving an instruction, on each said classified group basis, to set up a connection to a corresponding server and execute said data acquisition requests classified into the group in question.

32. A switching program for relaying packet communication through a communication network between a plurality of servers and clients by the control of a computer, comprising the functions of

during relay of a packet to be transmitted from said server to said client, rewriting header information of the packet in question to have the contents which are to be set when the packet in question is sent from said

switching apparatus and sending said packet to said
client, and

from the time of relay of a data acquisition
request from said client until the end of transmission
of a packet of an acknowledgement to be transmitted from
said server to said client, conducting one-way splicing
processing in the direction from the server in question
to the client in question, as well as successively
conducting retransmission control and flow control of
communication in the direction from said client to said
server.

33. The switching program as set forth in claim 32,
further comprising the functions of

managing a connection with each said client to
accept a connection and a request from each said client,

rewriting header information of a packet to be
transmitted from said server to said client to relay the
rewritten packet, and

managing a connection with each said server to
relay an instruction and data directed to each said
server which are sent from said client, wherein

header information of said packet including
a sequence number indicative of, in transmission
data divided into individual packets, order of data in a
packet in question,

a data length in and below a transport layer of

the packet in question,

an Ack number indicative of a sequence number of data that a communication partner has already received, and

20 a Win value indicative of a remaining capacity of a reception buffer that the communication partner is yet to receive.

34. The switching program as set forth in claim 33, further comprising the functions of

relaying transmission of packets from a plurality of said servers directed to one said client, and

5 removing, from header information of a packet to be relayed, a flag indicative of the end of transmission of a packet at individual said server,

thereby relaying a packet transmitted by the switching of said plurality of servers to said client without cut-off of a connection with said client.

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35. The switching program as set forth in claim 33, further comprising the function of

restoring transmission data to be transmitted in individual divisional packets from said client to said server to an original state prior to the division to selectively transmit each packet to the server.

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36. The switching program as set forth in claim 33,

further comprising the functions of

obtaining information of a request to be
transmitted by said client to each said server,

5 determining a server as a connection destination
to which the client in question connects based on said
request, and

10 giving an instruction to connect the client in
question with said server determined as a connection
destination,

thereby determining a server as a connection
destination to which each said client is to connect.

37. The switching program as set forth in claim 36,
further comprising the functions of

5 sequentially classifying data acquisition
requests yet to be processed which are issued by said
client into groups according to corresponding servers as
connection destinations, and

10 give an instruction, on each said classified
group basis, to set up a connection to a corresponding
server and execute said data acquisition requests
classified into the group in question.

38. A switching program operating on a server in a
communication system for conducting packet communication
between a server and a client through a switching
apparatus by the control of a computer on the server,

5 comprising the function of,

from the time of relay of a data acquisition
request from said client by said switching apparatus
until the end of transmission of a packet of an
acknowledgement to be transmitted to said client,
10 transmitting said packet to the client in question by
one-way splicing.

39. A switching program operating on a client in a
communication system for conducting packet communication
between a server and a client through a switching
apparatus by the control of a computer on the client,
5 comprising the function of,

from the time of relay of a data acquisition
request to said server by said switching apparatus until
the end of transmission of a packet of an
acknowledgement to be received from said server,
10 receiving said packet from the server in question by
one-way splicing.

40. A server in a communication system for conducting
packet communication between a server and a client
through a switching apparatus, wherein

from the time of relay of a data acquisition
5 request from said client by said switching apparatus
until the end of transmission of a packet of an
acknowledgement to be transmitted to said client, said

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server transmits said packet to the client in question by one-way splicing.

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41. The server as set forth in claim 40, wherein to said client, said server transmits said packet with header information rewritten to have the contents to be set when the packet in question is transmitted from said switching apparatus.

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42. The server as set forth in claim 41, wherein header information of said packet including a sequence number indicative of, in transmission data divided into individual packets, order of data in a packet in question, a data length of the packet in question, and an Ack number indicative of a sequence number of data that a communication partner has already received.

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43. The server as set forth in claim 42, wherein header information of said packet further includes a Win value indicative of a remaining capacity of a reception buffer that the communication partner is yet to receive.

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44. The server as set forth in claim 41, wherein said switching apparatus relays transmission of

packets from a plurality of said servers directed to one said client, and

5 from header information of a packet to be relayed,
a flag is removed which is indicative of the end of
transmission of a packet at individual said server,
 thereby relaying a packet transmitted by the
switching of said plurality of servers to said client
10 without cut-off of a connection with said client.

45. The server as set forth in claim 41, wherein
 transmission data to be transmitted in individual
divisional packets from said client is restored to an
original state prior to the division, whereby each
5 packet restored is received by a selected server.

46. The server as set forth in claim 41, wherein
 a server as a connection destination to which
each said client is to connect is determined by said
switching apparatus,

5 information of a request to be transmitted by
said client to each said server is obtained by said
switching apparatus,

 a server as a connection destination to which the
client in question is to connect is determined based on
10 said request, and

 an instruction to connect the client in question
with said server determined as a connection destination

is given.

47. The server as set forth in claim 46, wherein
data acquisition requests yet to be processed
which are issued by said client are sequentially
classified into groups as set forth in corresponding
servers as connection destinations, and

on each said classified group basis, an
instruction is given to set up a connection to a
corresponding server and execute said data acquisition
requests classified into the group in question.

48. A client in a communication system for conducting
packet communication between a server and a client
through a switching apparatus, wherein

from the time of relay of a data acquisition
request to said server by said switching apparatus until
the end of transmission of a packet of an
acknowledgement to be received from said server, said
client receives said packet from the server in question
by one-way splicing.

49. The client as set forth in claim 48, wherein
said client receives from said server, said
packet with header information rewritten to have the
contents to be set when the packet in question is
transmitted from said switching apparatus.

50. The client as set forth in claim 49, wherein
header information of said packet including
a sequence number indicative of, in transmission
data divided into individual packets, order of data in a
packet in question,

a data length of the packet in question, and
an Ack number indicative of a sequence number of
data that a communication partner has already received.

51. The client as set forth in claim 50, wherein
header information of said packet further
includes

a Win value indicative of a remaining capacity of
a reception buffer that the communication partner is yet
to receive.

52. The client as set forth in claim 49, wherein
said switching apparatus relays transmission of
packets from a plurality of said servers directed to one
said client, and

from header information of a packet to be relayed,
a flag is removed which is indicative of the end of
transmission of a packet at individual said server,
thereby relaying a packet transmitted by the
switching of said plurality of servers to said client
without cut-off of a connection with said client.

53. The client as set forth in claim 49, wherein
transmission data to be transmitted in individual
divisional packets from said client is restored to an
original state prior to the division and each packet
restored is transmitted to a selected server.

54. The client as set forth in claim 49, wherein
a server as a connection destination to which
each said client is to connect is determined by said
switching apparatus,

information of a request to be transmitted by
said client to each said server is obtained by said
switching apparatus,

a server as a connection destination to which the
client in question is to connect is determined based on
said request, and

an instruction to connect the client in question
with said server determined as a connection destination
is given.

55. The client as set forth in claim 54, wherein
data acquisition requests yet to be processed
which are issued by said client are sequentially
classified into groups according to corresponding
servers as connection destinations, and

on each said classified group basis, an

instruction is given to set up a connection to a corresponding server and execute said data acquisition requests classified into the group in question.

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